

RSAC
PTC Risk 2 Task Team
02-03 October 2002
St.Louis, MO
MINUTES (10-18-02)

In attendance:

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Frank Roskind	FRA	202-493-6284	frank.roskind@fra.dot.gov

Next Meeting Date December 17 & 18, 2002, 8:00 a.m. - 5 p.m. both days. Location TBD.

Documents distributed during the meeting:

PTC-RA2-OCT02-001	Letter from G. Gavalla and G. Cothen to AAR Colleagues, 3/22/02
PTC-RA2-OCT02-002	Draft for Guidance for Risk Assessment – Structuring the BaseCase and Scaling the Risk Assessment 3/14/02
PTC-RA2-OCT02-003	Email from Grady Cothen to Charles Dettmann with subject as Base cases, 4/10/02
PTC-RA2-OCT02-004	Discussion Paper, Industry Proposal to FRA for Processor Based Signal and Train Control Systems, undated AAR document
PTC-RA2-OCT02-005	Letter from C. E. Dettmann to George Gavalla with reference to Processor-Based Signal and Train Control Regulations, 4/17/02
PTC-RA2-OCT02-006	Email from Michael Rush of the AAR to Grady Cothen, 8/5/02
PTC-RA2-OCT02-007	A flowchart showing FRA concept of how the alternative base case system might work
PTC-RA2-OCT02-008	List of Attendee

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PTC-RA2-OCT02-009	Signal Territory PPA's
PTC-RA2-OCT02-010	Agenda
PTC-RA2-OCT02-011	Method of Operations Definitions - Stotts

8:30 a.m. CALL TO ORDER, INTRODUCTIONS, RESTATEMENT OF MISSION (FRA WOULD LIKE THE FIRST DISCUSSION TO CENTER AROUND BASE CASE ISSUES IN ORDER TO REMOVE OBSTACLES TO PUBLISHING A FINAL RULE)

Mr. Roskind discussed the ground rules of the meeting. He basically adopted the rules of the RSAC rulemaking and reviewed the task items of the group:

- Assist VOLPE Center in structuring data runs off CRAM Platform and other risk assessment models excluding ASCAP
- Be in standby status to address Base Case issue for final rule.
- Assist in structuring guidance materials for risk scenario development under the final rule.

To clarify the objectives and goals of this meeting, Mr. Roskind and Ms. Gross distributed several documents between FRA Office of Safety and the AAR on their positions and views of base cases under the definition of NPRM. The documents are PTC-RA2-OCT2-001 through PTC-RA2-OCT2-006. Additionally Frank distributed a flow chart PTC-RA2-OCT2-007 he had developed for the group.

Mr. Roskind gave a brief update on where ASCAP stands now:

Mr. DePaepe ask why is there no one from the UVA/ASCAP team here today?

Mr. Roskind said they were not invited.

Mr. Roskind reviewed with the group the questions he had developed on the agenda for the groups consideration. He expressed that his goal is to have one group recommendation at the end of this meeting, or less preferably have a menu of choices of base case determination for RSAC working group stating the pros and cons of each proposal in this menu. He also presented a chart showing that the accident rate in terms of PTC preventable accidents per train mile signal territory decreases as the traffic in terms of train miles increases. This is based the raw data of industry accident reports as part of CRAM program performed by Volpe. Thus, based on this chart, traffic density does not increase the risk, but in fact lower it.

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FRA suggested to the group for discussion the following definitions:

Standard base case – what is there now

Alternate base case – anything other than existing conditions on segment of track at the time of the proposed implementation

There were then two discussion items:

(1) Since each railroad has different accident rate, is it reasonable to use different accident rates for different railroads or should a consistent national average be applied to all proponents.

(2) AAR in the document PTC-RA2-OCT02-006 suggested that it may be impractical or too costly to analyze a large territory, and therefore a subset of the territory should be analyzed.

Mr. DePaepe questioned who will determine what is impractical and too costly and which subsets to use.

There was some question about whether some additional functionality added to an existing system would make the system fall the NPRM rule. It was not fully answered.

Other topics brought up for discussion:

- Microprocessor, define it
- Base case use:
 - Local i.e. Corridor? (Present Proposal)
 - National Average versus Railroad Average
- Mr. Ralph stated that anything filed under Appendix H already includes density in the product safety plan..

Lunch break

- Volpe made a presentation on the CRAM data. It was pointed out that CRAM data did not have historical track class for each line as this is changed very often, but do have control method and maximum speed. This information is important for the group to decide what may trigger an alternative base case. There was also some discussion if the base case is established with CRAM data, how one can use CRAM for proposed method. Dr. Borener pointed out that regression could be used for the proposed method by looking at the factors on various parameters to predict the risk level of the proposed method. It was pointed out that with the proposed method, it is also important to assess the new risk factors introduced by the new system, which historically do not exist. All agreed with that point. It is not certain how CRAM can be used in that aspect as there may not be any historical data for the new system to perform regression.

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The group attempted to answer the following questions:

- (1) What triggers an alternative base case?
- (2) What is the alternate base case?
- (3) How to develop the alternate base case?
- (4) What techniques should be used (e.g. use CRAM to develop national average)?

The group discussed using moving average of Risk but could not agree on how “risk factor creep” up or down would be handled.

Some discussion took place concerning using the grade crossing risk model but the group quickly determined it could not apply due to its structure, Federally funded but States use it.

The group began discussing whether cost of a base case be related to the total project?

Mr. Milhon indicated that BNSF would prefer to use a subset for risk assessment when they decide to use PTC across the railroad.

Generally, most people in the meeting agreed that to perform a risk assessment for the whole railroad is somewhat impractical however the group could not agree on how the subset would be selected and if FRA would have prior approval on use of the subsets.

Mr. DePaepe stated that he objected to any discussions in this vein and felt the railroads might use the data to their advantage and the “segments” will be something that could be manipulated

Mr. Milhon responded by asking if we’re not doing the whole railroad and it is not a little project, how do we solve this?

Mr. Roskind asked the group how about a National Standard?

AAR members stated that National Standard doesn’t have to be same for everyone but could be based on each railroad.

Mr. Stem ask the AAR if they consider safety as part of the cost factor when looking at installing PTC on given segments?

Mr. Ralph stated that they do consider safety as part of the cost factor when installing CTC but look at efficiency, and utilization as the justification for such projects concerned.

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Group requested that the HyRail compliant system and determined they would like to see a presentation/discussion on it in the future.

Mr. DePaepe stated he has some issues in Reference to AAR proposal related to Guidelines for risk scenario:

- Who decides it's impractical.
- Or too costly who determines
- How to pick the sub set/how do you know its representative
- Could you use the formula to degrade a present system (Base case & Alternate Base Case identifying hazards)
- Prescriptive requirements

Dr. Borener ask: Can we have a system level base case? How much characterization do we need? i.e. single track, opposing movements, ratio of passenger to freight (mixed), directional running (double track) etc.-

She ask the group can we use weighted average like in grade crossing's

Mr. Petit stated every processor based system we make in the future will fall under this, not just PTC Systems. We need to clarify what needs to be done i.e. replacing same type of systems with added functionality

Dr. Borener stated that using track class was difficult because one mile could have three different track classes in that mile.

Dr. Borener placed the following on the board for the group consideration relating to Probability -

(PTC System) = +train volume
Speed
Train control method
of tracks
Passenger of Freight mix ratio

Other segments that could be added: , Operator (human factors), merger (cultural issues), Operating Rules, time on duty, decisions points. Etc.

PTC total = weight(National)+weight(operator)+weight (local, specifics to that area)

Dr. Borener concluded by stating that she could use the data she has right now and develop a base case scenario, but she could not develop a risk based analysis.

The group began a discussion on alternate base case triggers and agreed that speed should be a factor to trigger an alternative base case. The following FRA required control system for each speed range was examined.

As a point of reference Mr. McCord put up the Track Class speed ranges contained in 49CFR213.

TRACK CLASS	FREIGHT	PASSENGER
X	10	N/A
1	10	15
2	25	30
3	40	60
4	60	80
5	80	90
6	N/A	110
7	N/A	125
8	N/A	160
9	N/A	200

After some initial discussion related to track class and speed the group seemed to agree that there were too many track class's to use this approach but liked using change of speed as a trigger to alternate base case.

Mr. Stotts suggested the group consider what's in 236:

Frt	Passenger	
50+	60+	MBS/ABS/TCS
80+ any train		ACS/ATS/ATC
111+		(Civil speed enforcement system)

Mr. Stotts suggested that to consider doubling the speed resulting in a new speed of 30 mph or greater as a new trigger for alternate base case. The pros and cons for this proposal (doubling the speed) was examined:

Pros	Cons
Higher risk is at slower speed	Too costly
The criterion will cover raising speed in the	Not required now

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The group agreed this is a good place to start but could not agree on the low speed range of 0-49.

Mr. Stotts stated he felt it was imperative that an increase (doubling) of the speed in the range of 0-49 must be included .

Mr. Roskind suggested the following for the groups consideration.

Nationwide Average

FRA publish acceptable accident rate by speed class (ranges of speed)

10 mph bands below 50

20 mph bands above 50

Density – 50% to 200%

Mr. Ralph stated that his railroad could not live with the speed bands as presented.

Mr. McCord and Mr. Stotts said they wanted to look at the data before agreeing.

Action item – Volpe is to generate plots of risk cost/Train Mile Vs Maximum Train Speed and risk cost/Train Mile Vs Trains/Time (# of trains/day.)

Generally, the group thought that a change in the method of operation should also be a factor to trigger the alternative base case. Volpe was able to generate preliminary plots on cost and PPA (PTC preventable accidents)/train mile as a function of maximum speed (track speed). The plots were not linear or exponential but rather have a peak and drop after a certain speed. Volpe was asked to finalize these plots for next meeting. There was also a question about the accuracy of the method of operation assigned by Volpe to the CRAM data on various lines. Volpe was asked to work with Mr. McCord and Mr. Stotts to improve upon the accuracy of the data, especially the method of operation.

Mr. Petit ask the question how do we track “best practices” for Risk Assessment (work between person doing the risk assessment and the railroad”. How have they been successful in the past? Lesson’s learned ?

Dr. Bley said this is a good point and there should be a catalog of best practices and lessons learned. Dr. Bley to coordinate the assembly.

Dr. Bley ask the question after developing who will maintain and accept ownership of it in the future?

Mr. Roskind posed a method of triggering the alternative base case, using the following as an example:

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- (1) You maximum speed and traffic density (number of trains a day) are 110 mph and 40 trains/day
- (2) Determine the nationwide risk level for this speed and density based on CRAM data, say 5.5×10^{-8} . There would be a table of risk level as a function of maximum speed and traffic density using CRAM data.
- (3) Determine the method of operation pertaining to this risk level by comparing to CRAM analysis of method of operation Vs risk level. Use the following as an example

Mr. Stotts commented here: This example was a hypothetical with the metrics pulled out of the air just as illustrations. Need to clarify that ABS, CS and probably ACSES are not designed to achieve these metrics. In my opinion ABS is only about 1×10^{-5} at the best, a risk of more than 3 orders of magnitude worse that shown here.

ABS	6×10^{-8}
CS	5.2×10^{-8}
ACSES	2.0×10^{-8}

Use CS as the alternative base case as the risk level is the closest to 5.5×10^{-8} , the risk level of the proposed maximum speed and traffic density.

- (4) Use ASCAP to compare CS, the alternative base case and the proposed method. In this method, ASCAP will be run to generate risk level for both the base case and the proposed method so that the relative risks can be compared so that consistency is maintained on all the assumptions.

The group voted to present the above method to the RSAC working group for discussion.

Mr. Stotts commented that Part 235 that governs the removal of existing train control system could be a trigger for an alternative base case. Mr. Stotts was asked to investigate further on this issue.

The railroads were asked to generate their own data such as accidents/train mile. Bob indicated they may have gross ton miles instead of train miles.

The group did not like the suggestion to use ASCAP to generate the risk level for the proposed case only and then to compare this risk level with the level generated by CRAM.

Adjourned for the day at 5:00 p.m.

Risk 2 Meeting Day 2

03 October 2002, St. Louis, MO

8:30 a.m. Caucus by each group and prepare positions.

Meeting began at 9:00 a.m.

Review of discussion was suggestions to Volpe for what they should look at:

- 1) Improve data accuracy (method of operation) Mr. McCord to handle.
- 2) How do we track best practices for risk assessments. (Work between person doing the risk assessment and the railroad.) I.e. how have they been successful in the past. What lessons were learned. There was a suggestion to form a subcommittee to catalog best practices & lessons learned. Dr. Bley to handle. Question: Who will maintain and accept ownership in the future?

Discussion resumed by Mr. Roskind offering the following diagram to show what the process would be:

Trigger
—
Find
Risk
Level
—
Select
Method of
Operation
—
ASCAP
Select
Method of
Operation
versus
proposed

ASCAP selected Method of Operation verses proposed.

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Mr. Roskind wrote the following:

Do we need triggers?

49CFR235 could be a trigger. 49CFR235.5 states as follows:

“235.5 Changes requiring filing of application.

(a) Except as provided in §235.7, applications shall be filed to cover the following:

(1) The discontinuance of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system or other similar appliance or device;

(2) The decrease of the limits of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system; or

(3) The modification of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system.”

The group considered the following:

Take out signals - standard base case , group agreed

Take out signals increase speed - alternate base case, group agreed

Upgrade signal system, installing a processor based system (may not capture anything, do we gain anything?) - Standard Base Case , group did not agree.

After some consideration Mr. Stotts said he needed to think about this some more and group assigned him to research and report if 235 should be a trigger to an alternate base case. Mr. DePaepe and Mr. Milhon are to assist him

Mr. Roskind presented the following document opening the discussion on method of operation as a trigger for an alternate base case:

The following definitions for methods of train operation to be used in the filing of the Signal Systems Annual Report Form, Form FRA F 6180-47 is found on the back of the form:

Traffic Control System A block signal system under which train movements are authorized by cab signals or block signals whose indications supersede the superiority of trains for both opposing and following movements on the same track.

Automatic Block Signal System A block signal system wherein the use of each block is governed by an automatic block signal, cab signal, or both.

Non Automatic Block Signal System A term used to denote any method of maintaining an interval of space between trains as distinguished from an automatic block signals system, a traffic control system, a cab signal system without roadway signals, or time interval system.

Automatic Cab Signal System A system which provides for the automatic operation of the following:

- (a) **Cab Signal**, located in the engineman's compartment or cab, indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals, and
- (b) **Cab Indicator**, a device located in the cab which indicates a condition or change of condition of one or more element of the system.

Remotely Controlled Interlocking: An arrangement of signals and signal appliances operated from an interlocking machine, which is located outside the interlocking limits, and so connected by means of mechanical and/or electric locking that their movements must succeed each other in proper sequence, train movements over all routes being governed by signal indications.

Identifying Methods of Operation

The following are adjective descriptions of various methods of operation that have historically been used in technical writings in connection with accident investigations, block signal applications, petitions for relief from the requirements, complaint investigations and citations of defects. The basis of these descriptions are specific rules for use of the systems or methods contained in the operating carrier's rulebook. Those in *italics* are or are almost non-exist. The listing begins with rules based methods followed by those that evolved as signal and train control systems were deployed.

"The method of operation is by timetable."

"The method of operation is by timetable and train orders."

"The method of operation is by train register rules."

"The method of operation is by staff system rules."

"The method of operation is by the current of traffic on two main tracks."

"The method of operation is by Track Warrant Control Rules."

"The method of operation is by Direct Traffic Control Rules."

"The method of operation is by Yard Limit Rules."

"The method of operation is by Voice Control Rules."

"The method of operation is by timetable and train orders supplemented by an automatic block signal system."

"The method of operation is by Track Warrant Control Rules supplemented by an automatic block signal system."

"The method of operation is by Direct Traffic Control Rules supplemented by an automatic block signal system."

"The method of operation is by cab indicator indications of a continuous inductive automatic train stop system arranged for movement with the current of traffic on two main tracks."

"The method of operation is by cab indicator indications of a train control system arranged for movements with the current of traffic on two main tracks."

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“The method of operation is by signal indications of an automatic block signal system on two main tracks arranged for movements with the current of traffic.”

“The method of operation is by signal indications of a traffic control system.”

“The method of operation is by signal indications of a traffic control system supplemented by automatic cab signals and train stop.”

“The method of operation is by signal indications of a traffic control system supplement by an intermittent inductive train stop system.”

“The method of operation is by cab signal indications of a traffic control system.”

“The method of operation on track Numbers 1 and 2 is by signal indications of an automatic block signal system arranged for the movement of trains with the current of traffic and on track Numbers 0 and 4 by signal indications of a traffic control system, all supplemented by a cab signal system with automatic train control.”

Discussion concerning method of operation began in regards to overlay systems.

The group agreed that overlay systems like CBTM that do no change the method of operation would not trigger an alternate base case.

The group discussed that imposing alternate base case issues (expense) in this area would discourage the carriers from developing overlay systems that would improve present conditions.

The question was asked, if an overlay changes or dilutes operating rules could it be a change in method of operation?

Mr. Stotts said he felt if it changes the set of rules the crews are required to operate under than it changes the method of operation.

Mr. Stem ask does it require different techniques by the crew? If it changes the way they interface with the system/equipment then it should be a change in the method of operation.

Mr. Milhon and Mr. Ralph did not agree with Mr. Stem or Mr. Stotts and maintained that as long as the basic way you operate and obtain authority has not changed it is not a change in the method of operations, example: CBTM is an overlay system and not a change in the way the crew receives authority or operates.

After some discussion the group did not agree on how to define method of operation. **They did seem to agree that a change in the method of operation would be a trigger for alternate base case.**

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The Group began a discussion on considering increased density as a trigger for alternate base case.

Volpe presented two charts on overheads each illustrated as follows:

Vertical - Risk/train miles

Horizontal - Speed (max. train speed)

Vertical - Risk cost/train miles

Horizontal - Trains/time

AAR questioned Volpe's data points.

After some discussion Volpe agreed to re do the charts to be sure they are correct and resubmit them to the group for consideration.

AAR will also bring charts for the next meeting but will use gross ton miles, per mile (instead of trains) and simple risk(Accident, fatalities and injuries)

Mr. Roskind then introduced a discussion about "absolute risk" as opposed to "relative risk". ASCAP is meant to derive the "relative risk."

Volpe suggested a type of fault tree analysis with a "yes" (1) or "no" (0) answer. They stated it stays away from the numerical analysis and delivers an acceptable risk analysis.

Mr. Petit suggested that if you design a system according to existing signal principles and excepted industry standards such as military, IEEE and AREMA standards then you do not have to go the comparative risk analysis.

Mr. Roskind asked if the NPRM allowed this scenario, and if so does this group want to recommend its inclusion in the preamble or modifying the rule to make it permissible.

Mr. DePaepe responded that he did not believe that it was permissible under the current NPRM. The NPRM calls for an independent analysis verifying that the system is safe to a high degree of confidence. If, what Mr. Petit said is allowed we will be back to where we were at the beginning. The suppliers will be telling us to “trust them” that it is safe. This is unacceptable. This discussion of lowering the safety bar because it is too expensive to properly do the safety analysis, is a crock of manure. The carrier’s wanted performance standards well they got them. Now they have to comply with the regulation that they agreed to. Now is not the time to alter those commitments, nor allow the carriers to get a second, third and fourth bite of the apple.

Mr. Petit responded that the comment was related to not needing risk assessment and not related to independent safety analysis.

LUNCH

RESUMED DISCUSSION AND RESOLVE BASE CASE ISSUES

Mr. Milhon brought up the concern that doing the risk analysis in segments of 100-mile increments would be extremely costly. He suggested that they be allowed to run some risk analyses on 100-mile segments of the railroad and then these analyses could be extrapolated across their entire system.

Mr. Roskind then moved the discussion toward risk scenario development and asked that it should include several segments where comparison is representative of the territory.

Items to be considered:

- 1) Hills (topography), curves (all physical characteristics)
- 2) Climate (humidity and temperature)
- 3) Density & frequency of traffic
- 4) Method of operation
- 5) Speed

This discussion relates to the Mike Rush email, Mr. DePaepe objected to yesterday and he restated his objections.

The email stated as follows:

“If the geographic territory over which the new system will be applied is so large that analyzing the risk for the territory is impractical, or too costly, the risk assessment may be performed over a subset of the territory as long as the subset representative of the whole.”

Mr. DePaepe restated his concerns:

- Who or what determines if “...analyzing the risk for the territory is impractical?”
- Who or what determines what is “too costly?”
- Who or what determines which subset is representative of the whole?

Mr. DePaepe stated he was against entertaining suggestions to this process without these three questions being answered. There is way too much wiggle room in the Mike Rush email.

Mr. Roskind asked the group *if* you were going to allow this, what conditions would you have to consider?

Mr. DePaepe ask in other words you are asking me what would it take to get me to agree to something that I think should not be allowed? Tim responded he's not going to provide an answer to a question shouldn't be ask.

Mr. Petitt suggested some sort of paper analysis why safety is not dependent on those factors. Develop widely varying parameters that if it doesn't affect it you are done. If taken to the safety analysis stage use widely varying parameters.

The group did not agree and Mr. DePaepe strongly objected.

After a short break Dr. Dennis C. Bley, Ph.D, gave a presentation on **“What is a Risk Assessment?”**.

ADJOURN 4:00 p.m.